WHAT IS CLAIMED IS:

1. A switching element comprising:

a first actuator enabled for physical movement to selectively manipulate movement of a fluid within a gap; and

a first optical waveguide and a second optical waveguide that intersect said gap such that optical communication from said first waveguide to said second waveguide is determined by a presence of said fluid within said gap, said fluid being selectively manipulated in response to said physical movement of said first actuator.

2. The switching element of claim 1 wherein said first actuator is configured for reciprocating movement and is positioned to determine fluidic communication within said gap, said fluid being selectively displaced when said first actuator is moved between first and second positions.

3. The switching element of claim 2 wherein said reciprocating movement is made in response to applications of an input voltage, said first actuator being disposed to achieve volumetric variations with said reciprocating movement.

4. The switching element of claim 2 wherein said gap is defined by a trench having walls for containing said fluid within said gap, said first actuator positioned along one of said walls for displacing said fluid within said gap.

5. The switching element of claim 4 wherein said first actuator is a piezoelectrically driven actuator and includes a membrane that is configured to switch between an outward position and an inward position in relation to said wall.

6. The switching element of claim 5 wherein said membrane includes a stress-biased lead zirconia titanate (PZT) material.

7. The switching element of claim 5 wherein said membrane is coupled to a first electrode on a first side and a second electrode on a second side, said first side and said second side being on opposite sides of said membrane, said first electrode being coupled to a voltage source by a first electrical connection and said second electrode being coupled to said voltage source by a second electrical connection.

8. The switching element of claim 7 wherein said first electrical connection is provided on a side of said membrane opposite to said second electrical connection.

9. The switching element of claim 7 wherein said first electrical connection is provided on a same side of said membrane as said second electrical connection, said first electrical connection being coupled to said first electrode by a conductor.

10. The switching element of claim 1 wherein said fluid includes at least one of a liquid and a gas, said liquid having an index of refraction similar to an index of refraction of said first and second optical waveguides.

11. The switching element of claim 10 wherein said gas is one of an inert gas and a combination of inert gases, said gas being at least one of nitrogen, xenon, krypton, argon, neon, helium, carbon dioxide, and sulfur hexafluoride.

12. The switching element of claim 2 further comprising a second actuator, said second actuator and said first actuator being on opposing sides of said gap, wherein said second actuator is in fluidic communication with said gap, said fluid being selectively displaced when said second actuator is activated for said reciprocating movement.

13. The switching element of claim 1 wherein said first and second waveguides are in optical communication when said fluid is present within said gap, said switching element further comprising a third optical waveguide intersecting said gap such that said first and third waveguides are in optical communication when said fluid is absent from said gap.

14. An optical switch comprising:

a first light-transmitting waveguide and a second light-transmitting waveguide having ends at an intersecting region, wherein optical transmission between said first and second waveguides is determined by a presence of a fluid within said intersecting region, said intersecting region being a portion of a trench having a plurality of surfaces for accommodating said fluid; and

a first electrically movable member in operative communication with said intersecting region via said fluid, said first electrically movable member being configured to move between a plurality of predetermined orientations for displacing said fluid relative to said intersecting region.

15. The optical switch of claim 14 wherein said first electrically movable member is positioned along one of said surfaces of said trench, said first electrically movable member being configured to move among a convex orientation, a concave orientation, and a relaxed orientation with respect to said one surface, said relaxed orientation being one in which a location of said first electrically movable member is generally aligned with an imaginary surface that extends along said one surface.

16. The optical switch of claim 15 wherein said first electrically movable member is configured to move between a first orientation and a second orientation, said first and second orientations being separate ones of said convex, concave and relaxed orientations.

17. The optical switch of claim 15 wherein said convex orientation displaces said fluid in a direction away from said first electrically movable member and said concave orientation enables said fluid to flow in a direction toward said first electrically movable member.

18. The optical switch of claim 15 wherein said first electrically movable member is a piezoelectric membrane in which an application of an electric potential displaces said piezoelectric membrane to one of said convex, concave and relaxed orientations.

19. The optical switch of claim 14 wherein said fluid includes a first bubble and a second bubble disposed in said trench, said first bubble being selectively displaced into said intersecting region when said first electrically movable member is in one of said predetermined orientations, said first and second bubbles being compressed when said first bubble is at said intersecting region.

20. The optical switch of claim 14 further comprising a second electrically movable member that is at an opposite side of said intersecting region from said first electrically movable member, said second electrically movable member being in operative communication with said intersecting region and being configured to move between one of said predetermined orientations for displacing said fluid relative to said intersecting region.

21. The optical switch of claim 20 wherein said fluid includes a bubble disposed in said trench, said bubble being selectively displaced into said intersecting region when said first electrically movable member is in a first predetermined orientation and said second electrically movable member is in a second predetermined orientation, said first and second predetermined orientations being dissimilar orientations.

22. A method for manipulating optical communication in an optical switch comprising:

providing an input waveguide and an output waveguide;

providing a trench at an intersecting gap of said input and output waveguides;

receiving an optical signal at said input waveguide;

enabling a piezoelectric actuator to switch between a plurality of configurations for displacing a fluid within said intersecting gap such that said optical communication from said input waveguide to said output waveguide is dependent upon a presence of said fluid within said intersecting gap; and

transmitting said optical signal from said input waveguide to said output waveguide.

23. The method of claim 22 wherein said step of enabling includes manipulating said piezoelectric actuator to switch among an outward configuration, an inward configuration and a flat configuration with respect to a surface of said trench, said piezoelectric actuator being in fluidic communication with said intersecting gap such that said fluid is displaced relative to said intersecting gap in response to said piezoelectric actuator being displaced to one of said outward, inward and flat configurations.

24. The method of claim 23 wherein said step of manipulating includes providing a piezoelectrically-driven membrane to switch among one of said outward, inward and flat configurations in response to voltage inputs.

25. A method for operating an optical switch comprising:

piezoelectrically actuating a first membrane to manipulate a change in volume of a fluid container such that a fluid disposed within said fluid container moves between a coupling position in which light from a first waveguide is received by a second waveguide and a noncoupling position in which light from a first waveguide is not received by said second waveguide.

26. The method of claim 25 further comprising reversing said movement of said fluid by piezoelectrically actuating said first membrane, resulting in a reversal of said change in said volume.

27. The method of claim 25 further comprising reversing said movement of said fluid by piezoelectrically actuating a second membrane.